United States Department of Agriculture
Cooperative State Research, Education, and Extension Service,
Office of the Administrator

Annual Review for 2005

Portfolio 1.3 (New Food Processing and Bio-Based Products)

Supporting Objective: Provide Science-Based Information, knowledge, and education to facilitate risk management by farmers and ranchers

CSREES *Goal: Enhance Economic Opportunities for Agricultural Producers*

For the period 1998-2004

2005 INTERNAL REVIEW PORTFOLIO: STRATEGIC OBJECTIVE 1.3
(Objective 2.1 in CSREES Strategic Plan 2007-2012)

Food and Non-Food

Response to External Review Panel Recommendations from May 2004

and

Progress Report

through FY 1998 and FY 2004

April, 2005

Guide for Preparation of 2005 Internal Portfolio Review

I. Background

This document was prepared in April, 2005 as the internal review of Portfolio 1.3 for fiscal years 1998-2004. It contains updates to the portfolio, responses to the comments of the external panel review and changes to criteria scores with accompanying justifications. This document is a result of the efforts of the National Program Leaders from the Plant & Animal Systems Unit in collaboration with CSREES Planning and Accountability.

- **The following knowledge areas (KAs) are included in Portfolio 1.3**
  - 501: New and Improved Food Processes
  - 502: New and Improved Food Products
  - 503: Quality Maintenance in Storage
  - 504: Home and Commercial Food Service
  - 511: New and Improved Non-Food Products
  - 512: Non-Food Quality Maintenance in Storage

- **Portfolio reviews:**
  External Review: May 2004
  Internal Review: April 2005

- **Portfolio score from the PREP in 2004: 80**

Portfolio 1.3 received an overall score of 80 from the panel in the 2004 PREP. Portfolio 1.3 received an overall score of 83 for its 2005 internal review. Table I-2 below shows the breakdown of scores for different questions and criteria.

Table I-2. Scoring of 2004 PREP Expert Panel

Criteria	Panel Score	2005 Score
Relevance		
1. Scope	3	3
2. Focus	2	2
3. Emerging Issues	2	2
4. Integration	1	2
5. Multi-disciplinary	3	3
Quality		
1. Significance	3	3
2. Stakeholder	2	3
3. Alignment	3	3
4. Methodology	3	2
Performance		
1. Productivity	2	2
2. Comprehensiveness	2	2
3. Timeliness	1	2
4. Agency guidance	3	3
5. Accountability	2	2
Overall score	**80**	**83**

II. CSREES response to PREP recommendations that cross all portfolios

In response to directives from the Office of Management and Budget (OMB) of the President, CSREES implemented the Portfolio Review Expert Panel (PREP) process to systematically review its progress in achieving its mission. Since this process began in 2003, fourteen expert review panels have been convened and each has published a report offering recommendations and guidance. These external reviews occur on a rolling five-year basis. In the four off years an internal panel is assembled to examine how well CSREES is addressing the expert panel's recommendations. These internal reports are crafted to specifically address the issues raised for a particular portfolio; however, despite the fact that the expert reports were all written independent of one another on portfolios comprised of very different subject matter, several themes common to the set of review reports have emerged. This set of issues has repeatedly been identified by expert panels and requires an agency-wide response. The agency has taken a series of steps to effectively respond to those overarching issues.

Issue 1: Getting Credit When Credit is Due

For the most part panelists were complimentary when examples showing partnerships and leveraging of funds were used. However, panelists saw a strong need for CSREES to better assert itself and its name into the reporting process. Panelists believed that principal investigators who conduct the research, education and extension activities funded by CSREES often do not highlight the contributions made by CSREES. Multiple panel reports suggested CSREES better monitor reports of its funding and ensure that the agency is properly credited. Many panelists were unaware of the breadth of CSREES activities and believe their lack of knowledge is partly a result of CSREES not receiving credit in publications and other material made possible by CSREES funding.

Issue 1: Agency Response:

To address the issue of lack of credit being given to CSREES for funded projects, the Agency implemented several efforts likely to improve this situation in 2005.

First it developed a standard paragraph about CSREES's work and funding that project managers can easily insert into documents, papers and other material funded in part or entirely by CSREES.

Second, the Agency is in the process of implementing the "One Solution" concept. One Solution will allow for the better integration, reporting and publication of CSREES material on the web. In addition, the new Plan of Work (POW), centered a logic model framework, became operational in June 2006. The logic model framework is discussed in more detail below. Because of the new POW requirements and the POW training conducted by the Office of Planning and Accountability (also described in more detail below), it will be simpler for state and local partners to line up the work they are doing with agency expenditures. This in turn will make it easier for project managers to cite CSREES contributions when appropriate.

Issue 2: Partnership with Universities

Panelists felt that the concept of partnership was not being adequately presented. Panelists saw a need for more detail to be made available. Questions revolving around long-term planning

between the entities were common as were ones that asked how the CSREES mission and goals were being supported through its partnership with universities and vice versa.

Issue 2: Agency Response:
CSREES has taken several steps to strengthen its relationship with university partners. First, to the extent possible, implementing partners will be attending the CSREES strategic development exercise which is intended to help partners and CSREES fully align what is done at the local level. Second, CSREES has realigned the state assignments for its National Program Leaders (NPLs). Each state is now assigned to one specific NPL. By reducing the number of states on which any individual NPL is asked to concentrate and assigning and training NPLs for this duty, better communication between state and NPLs should occur. Finally, several trainings that focused on the POW were conducted by CSREES in geographic regions throughout the country. A major goal of this training was to better communicate CSREES goals to state leaders which will facilitate better planning between the universities and CSREES.

Issue 3: National Program Leaders
Without exception the portfolio review panels were complimentary of the work being done by NPLs. They believe NPLs have significant responsibility, are experts in the field and do a difficult job admirably. Understanding the specific job functions of NPLs was something that helped panelists in the review process. Panelists did however mention that often times there are gaps in the assignments given to NPLs. Those gaps leave holes in programmatic coverage.

Issue 3: Agency Response:
CSREES values the substantive expertise that NPLs bring to the Agency and therefore requires all NPLs to be experts in their respective fields. Given the budget constraints often times faced by the agency, the agency has not always been able to fund needed positions and had to prioritize its hiring for open positions. In addition, because of the level of expertise CSREES requires of its NPLs, quick hires are not always possible. Often, CSREES is unable to meet the salary demands of those it wishes to hire. It is essential that position gaps not only be filled but that they be filled with the most qualified candidate.

Operating under these constraints and given inevitable staff turnover, gaps will always remain. However, establishing and drawing together multidisciplinary teams required to complete the portfolio reviews has allowed the Agency to identify gaps in program knowledge and ensure that these needs are addressed in a timely fashion. To the extent that specific gaps are mentioned by the expert panels, the urgency to fill them is heightened.

Issue 4: Integration
Lack of integration has been highlighted throughout the panel reviews. While review panelists certainly noted in their reports where they observed instances of integration, almost without fail panel reports sought more documentation in this regard.

Issue 4: Agency Response:
Complex problems require creative and integrated approaches that cut across disciplines and knowledge areas. CSREES has recognized the need for these approaches and has undertaken steps to remedy this situation. CSREES has recently mandated that up to 20% of all 405 funds be put aside specifically for integrated projects. These projects cut across functions as well as

disciplines and ensure that future Agency work will be better integrated. Finally, integration is advanced through the portfolio process which requires cooperation across units and programmatic areas.

Issue 5: Extension

While most panels seemed satisfied at the level of discussion that focused on research, the same does not hold true for extension. There was a call for more detail and more outcome examples based upon extension activities. There was a consistent request for more detail regarding not just the activities undertaken by extension but documentation of specific results these activities achieved.

Issue 5: Agency Response:

Outcomes that come about as a result of extension are, by the very nature of the work, more difficult to document than the outcomes of a research project. CSREES has recently shuffled its strategy of assigning NPLs to serve as liaisons for states. In the past, one NPL might serve as a liaison to several states or a region comprised of states. Each state will be assigned a specific NPL and no NPL will serve as the lead representative to more than one state. This will ensure more attention is paid to extension activities.

In addition CSREES also has been in discussion with partners and they have pledged to do their best to address this issue. The new POW will make extension-based results and reporting a priority. Placing heavy emphasis on logic models by CSREES will have the effect of necessitating the inclusion of extension activities into the state's POWs. This, in turn, will require more reporting on extension activities and allow for improved documentation of extension impact.

Issue 6: Program Evaluation

Panelists were complimentary in that they saw the creation of the Office of Planning and Accountability and portfolio reviews as being the first steps towards more encompassing program evaluation work; however, they emphasized the need to see outcomes and often stated that the scores they gave were partially the result of their own personal experiences rather than specific program outcomes documented in the portfolios. In other words, they know first hand that CSREES is having an impact but would like to see more systematic and comprehensive documentation of this impact in the reports.

Issue 6: Agency Response:

The effective management of programs is at the heart of the work conducted at CSREES and program evaluation is an essential component of effective management. In 2003 the PREP process and subsequent internal reviews were implemented. Over the past three years fourteen portfolios have been reviewed by expert panel members and each year this process improves. NPLs are now familiar with the process and the staff of the Planning and Accountability unit has implemented a systematic process for pulling together the material required for these reports.

Simply managing the process more effectively is not sufficient for raising the level of program evaluations being done on CSREES funded projects to the highest standard. Good program evaluation is a process that requires constant attention by all stakeholders and the agency has

focused on building the skill sets of stakeholders in the area of program evaluation. The Office of Planning and Accountability has conducted training in the area of evaluation for both NPLs and for staff working at Land-Grant universities. This training is available electronically and the Office of Planning and Accountability will be working with NPLs to deliver training to those in the field.

The Office of Planning and Accountability is working more closely with individual programs to ensure successful evaluations are developed, implemented and the data analyzed. Senior leadership at CSREES has begun to embrace program evaluation and over the coming years CSREES expects to see state leaders and project directors more effectively report on the outcomes of their programs as they begin to implement more rigorous program evaluation. The new POW system ensures data needed for good program evaluation will be available in the future.

Issue 7: Logic Models

Panelists were consistently impressed with the logic models and the range of their potential applications. They expressed the desire to see the logic model process used by all projects funded by CSREES and hoped not only would NPLs continue to use them in their work but, also, that those conducting the research and implementing extension activities would begin to incorporate them into their work plans.

Issue 7: Agency Response:

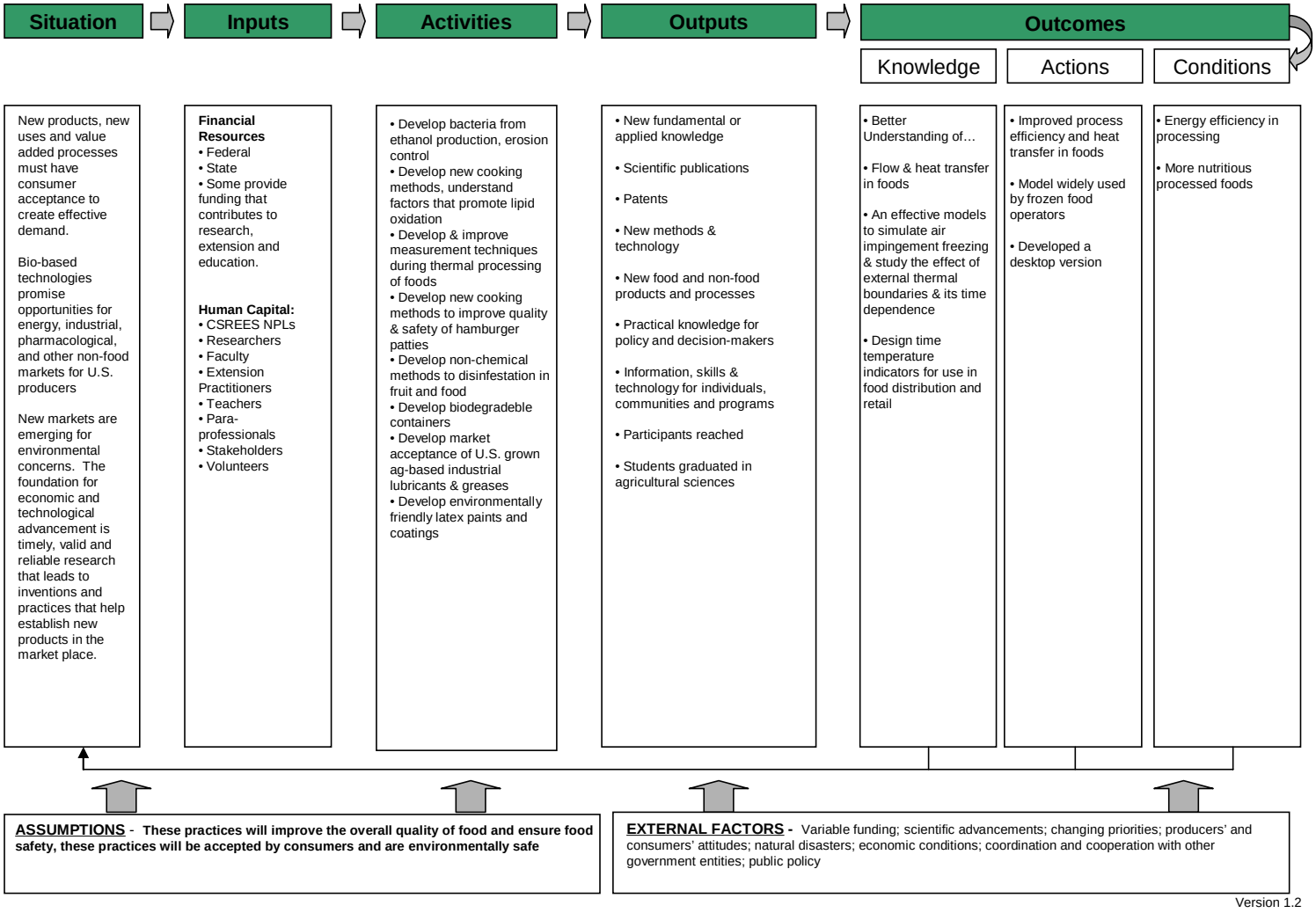
Logic models have become a staple of the work being done at CSREES and the Agency has been proactive in promoting the use of logic models to its state partners. Two recent initiatives highlight this. First, in 2005, the POW reporting system into which states submit descriptions of their accomplishments was completely revamped. The new reporting system now closely matches the logic models being used in portfolio reports. Beginning in fiscal year 2007, states will be required to enter all of the following components of a standard logic model. These components include describing the following:

- Program Situation
- Program Assumption
- Program Long Term Goals
- Program Inputs which include both monetary and staffing
- Program Output which include such things as patents
- Short Term Outcome Goals
- Medium Term Outcome Goals
- Long Term Outcome Goals
- External Factors
- Target Audience

The system is now operational and states were required to begin using it by June of 2006. By requiring the inclusion of the data components listed above states are in essence, creating a logic model that CSREES believes will help improve both program management and outcome reporting. Please note a sample logic model has been included in Appendix A.

The second recent initiative by CSREES regarding logic models concerns a set of training sessions conducted by Planning and Accountability staff. In October and November of 2005 four separate training sessions were held in Monterrey, California, Lincoln, Nebraska, Washington D.C. and Charleston, South Carolina. More than 200 people representing land-grant universities attended these sessions where they were given training in logic model creation, program planning, and evaluation. In addition, two training sessions were provided to NPLs in December 2005 and January 2006 to further familiarize them with the logic model process. Ultimately it is hoped these representatives will pass on to others in the Land-Grant system what they learned about logic models thus creating a network of individuals utilizing the same general approach to strategic planning. These materials also have been made available to the public on the CSREES website.

Enhance Economic Opportunities for Agricultural Producers – Portfolio 1.3



Version 1.2

III. Nation Program Leader Responses

- **A Brief Summary of the PREP Report with the Panel's Specific Portfolio Recommendations:**

The panel found that the people of CSREES (insert unit here) make a significant difference and add considerable value to the work of both the agency and the partnership. The evidence presented in this portfolio reflects hard work and indicates high levels of productivity. There is evidence of increasing emphasis on integration and that CSREES staffs are becoming more creative and determined about planning and reporting as forms of accountability.

The panel recommends continued effort in partnerships with 1890 and 1994 institutions. Many opportunities exist for programming on critical issues, expanding urban track issues and the issue of wildlife-urban interface. National needs can often be met by working in international collaborations and contexts.

The panel suggests that the partnership continue to expand interactions with stakeholders to include "emerging stakeholders." It is as important for planning processes to identify new stakeholders and partners as it is for the process to identify emerging issues and priorities. Further, players throughout the partnership should examine all federal reports across states within program areas in order to document the synergistic effect of integrated funding on levels of research, education and extension productivity.

There is a need to standardize and expand the documentation and evaluation metrics across program areas and increase the archiving and accessibility of research project data (in the CRIS and other systems). This is necessary in order to permit meta-analysis of the data.

The panel recommends training on the logic model for agency employees and external and internal partners. Instead of just evaluating past performance, the panel also suggests developing strategic plans for each problem area and increasing stakeholder contributions by including panel members and other stakeholders in the development and review of CSREES strategic plans at the portfolio level.

Finally, the panel suggests increasing the documentation of outcomes. Formative evaluations to document program implementation successes and challenges should be performed.

- **NPLs' Response to the Panel**

Recommendations from the Food and Non-Food Products Portfolio Review have been addressed in the past year as follows:

1. *The chief weakness relates to integration of education and extension with research –*
    - The National Research Initiative has the authority to fund up to 20% of its annual budget for integrated projects. Many NRI programs have included integrated priorities in the annual request for applications.
    - A Multistate committee, S-1007 Science and Engineering for a Biobased Industry and Economy, consisting of scientists representing research, education and extension from all over the country, has been holding annual meetings since 2001. This is an

excellent forum to develop integrated approaches to address critical issues in this important area.

2. *The portfolio is spread thin* -
   - Shared Faculty has been hired for expertise in the economics of bioenergy technologies.
   - The National Research Initiative has focused the priorities of the Biobased Products Bioenergy Research Program. The current priorities of the program include the biological conversion of agricultural biomass and the identification of sustainable agricultural biomass for the production of value-added products including bioenergy. Basic plant science activities are now supported by NRI programs focusing on biochemistry and genomics.

3. *[The portfolio] could be better integrated as a portfolio instead as individual PAs; NPLs may be operating individually, instead of as a team –*

   Focus

   The descriptor language was unclear and the Panel recognizes that NPLs have little control over what happens at the state level. The Portfolio was focused—every Program Area presentation included contemporary issues and cutting edge technology, and is consistent with the Science Roadmap—but could be better integrated as a portfolio instead of individual PAs; NPLs may be operating individually, instead of as a team. Obesity, while an important national issue, is misplaced in this portfolio.

   Recommendation

   The Panel believes that the portfolios need to be reviewed and integrated to make sure all appropriate areas are in the correct portfolios (e.g., food safety, economics, policy, international trade, and market development). The Panel believes that the Portfolio showed evidence of curiosity in seeking out what new knowledge needs to be found, which is good. The Portfolio process is new, and the progress is positive. Based on the scoring sheet descriptor language used for this review, though, the Portfolio was not fully focused.

   Action

   The following knowledge areas were brought in to realign and strengthen the Food and Non Food Product Portfolio. They will be included in the next internal annual review. The funding, activities, and outcomes for these KAs are not reflected in the current tables and logic models:
   - 401: Structure, Facilities, and General Purpose Form Supplies
   - 402: Engineering Systems and Equipment
   - 404: Instrumentation and Control Systems

4. *Portfolios need to be reviewed and integrated to make sure all appropriate areas are in the correct portfolios* - This will be addressed when preparing the review document in the next cycle.

5. *Based on the descriptor language, though, the Portfolio was not fully focused* - [Planning and Accountability will have to provide instruction about how to resolve the difference in determining project directions between different funding mechanisms, namely competitive grants, formula funds and special research grants.]
6. *Panel encourages further coordination with agencies working with bio-based technologies, bio-products and energy*. -
    - NPLs continue to serve on USDA's Biobased Products Bioenergy Coordination Council;
    - NPL is collaborating with U.S. Army on a full scale demonstration of biobased hydraulic fluids at Fort Leonard Wood in Missouri;
    - NPLs interact on a regular basis with DOE Office of Biomass to assist in evaluation of progress in key topic areas;
    - NPL serves on 2 advisory boards for projects that are funded by DOE.
    - CSREES is an active participant in the Interagency Metabolic Engineering Working Group which is formed of eight federal agencies (NSF, NIH, NASA, EPA, DOE, NIST, USDA, DOD). The agency leverages a $400,000 investment to the total Working Group investment of $6M to support metabolic engineering for bioproducts and biofuel production.
    - Under the National Nanotechnology Initiative, NPL coordinates the agency's nanotechnology program, which encourages and supports research and education relevant to this portfolio, with 22 other participating Federal agencies.

7. *A process needs to be devised to keep the Portfolio current* - The process is described in the performance elements for NPLs.

8. *Lack of curricula dealing with biobased resources* -
    - The Multidisciplinary Graduate Education Training award to Cornell University in 2001 has resulted in approximately 25 graduate students trained in biobased related technologies;
    - Department of Bioproducts and Biosystems Engineering was established at University of Minnesota;
    - Higher Education has made awards for curriculum development that focuses on biomass and product development;
    - 2006 Higher Education Challenge Grants RFA includes biobased product and technologies as a priority area;
    - Institute of Biobased Products at Montana State University is in its third year;
    - Ohio State University has established a The Ohio Bioproducts Innovation Center.

9. *This is a very opportunistic portfolio for multidisciplinary activities. Other areas for inclusion the Portfolio are business and managerial activities, economics, and competitive impacts* -
   This is an opportunity to engage in outreach to capture and integrate teaching and extension with research.
    - Integration of R, E, E and multidisciplinary activities cannot necessarily be required across the PA because of the nature of various funding authorities.

- Most biobased projects are inherently multidisciplinary and many include economic and marketing activities. The best examples of integrated/multidisciplinary activities can be found in IFAFS projects, some of which are still active through 2005;
- The Biodiesel Fuel Education Program at the University of Idaho addresses outreach by educating the public about the benefits of using biodiesel through technical reports and workshops tailored for a variety of audiences.

10. *The evaluation process needs work –*
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11. *Review Panel would like to see examples of cutting-edge methodologies highlighted* -
NPLs did that for the review. SBIR added Animal Waste as a topic area in 2005, and value-added products are included in the RFA

12. Better post award management is necessary to get the proper data/there is room for improvement of documentation -
- S-1007 Multistate committee is completing first round of site visits to Biomass Initiative awardees and reports serve as the basis for a report to Congress in 2005 regarding the status of the program;
- specific instructions are given to principal investigators regarding substantive and timely reporting to CRIS;
- template for reporting results and impacts is under development.

- The NRI and SBIR have initiated many post award management activities including: presenting highlights in an annual report, conducting annual PI meetings, preparing success story highlights for dissemination to stakeholders, and site visits.

13. *CSREES needs to present evidence of system timeliness and completeness* -
    - The plan for future response over the next few years until the PREP reconvenes in 2009
    - CSREES comments on the results of those implemented recommendations in terms of assisting in meeting the Portfolio's mission.
    - CSREES comments on why some recommendations could not/should not be followed.
    - CSREES plans to fill data/evaluation results gaps identified by the PREP.

IV. Portfolio Updates

1. Funding Tables

Table 1: CSREES Research Funding for Portfolio 1.3 by Source during 1998-2004

	($ in the Thousands)							
Funding Source	1998	1999	2000	2001	2002	2003	2004	**Grand Total**
Hatch	8,230	8,595	8,647	8,740	8,657	9,077	8,755	**60,701**
McIntire-Stennis	1,462	1,674	1,540	1,297	1,231	1,087	823	**9,114**
Evans Allen	2,272	2,443	1,547	1,479	1,411	1,489	1,392	**12,033**
Animal Health	0	0	0	0	0	0	0	**0**
Special Grants	5,674	6,102	7,163	9,102	9,427	12,372	13,547	**63,387**
NRI Grants	3,800	6,620	2,950	10,764	5,448	10,832	7,945	**48,359**
SBIR Grants	2,643	2,384	1,608	2,817	4,173	5,445	5,194	**24,264**
Other CSREES	2,134	3,696	12,925	14,994	4,015	5,699	6,114	**49,577**
Total CSREES	**26,230**	**31,514**	**36,380**	**49,193**	**34,362**	**46,001**	**43,770**	**267,450**

Source: Current Research Information System

Table 2: Funding from All Sources for Portfolio 1.3 during 1998-2004								
	($ in the Thousands)							
Funding Source	1998	1999	2000	2001	2002	2003	2004	**Grand Total**
CSREES	26,230	31,514	36,380	49,192	34,359	46,002	43,771	**267,448**
Other USDA	2,934	3,112	3,475	4,350	4,990	5,322	4,866	**29,049**
Other Federal	5,130	6,509	9,487	9,576	7,572	7,489	11,796	**57,559**
State Appropriations	50,995	53,583	58,012	64,275	63,879	59,621	57,921	**408,286**
Private or Self Generated	4,053	5,504	4,724	5,195	5,584	5,386	6,626	**37,072**
Industry Grants and Agreements	14,050	14,874	13,872	14,119	13,589	14,694	13,484	**98,682**
Other non-federal	6,541	6,788	6,979	8,239	8,493	8,541	8,424	**54,005**
Grand Total	**109,933**	**121,884**	**132,929**	**154,946**	**138,466**	**147,055**	**146,888**	**952,101**

Source: Current Research Information System

Table 3: CSREES Funding for Portfolio 1.3 by Knowledge Area during 1998-2004								
	($ in the Thousands)							
Knowledge Area	1998	1999	2000	2001	2002	2003	2004	**Grand Total**
501: New and Improved Food Processes	5,919	6,683	6,825	9,887	10,255	10,477	10,902	**60,948**
502: New and Improved Food Products	6,354	8,119	7,344	11,404	8,358	8,554	9,970	**60,103**
503: Quality Maintenance in Storage	3,275	6,302	5,423	5,546	3,945	4,774	5,257	**34,522**
504: Home and Commercial Food Service	184	39	486	94	334	1,409	516	**3,062**
511: New and Improved Non-Food Production	10,095	10,020	15,970	21,935	10,841	19,838	16,522	**105,221**
512: Non-Food Quality Maintenance and Storage	403	$6,683	$6,825	$9,887	$10,255	$10,477	$10,902	**$55,029**
Total	**26,230**	**31,163**	**36,048**	**48,866**	**33,733**	**45,052**	**43,167**	**55,432**

Source: Current Research Information System

The annual CSREES funding for F&NFP during the period 1998-2002 is shown by source in the Table 1. Hatch and McIntire-Stennis allocations remained steady during the five year period. Evans-Allen funding decreased steadily during the same period. Special grants on the other hand, increased steadily and 2002 allocation was 66% higher than the same in 1988. There were significant increases in funding in the "other CSREES" category during the years 2000 and 2001.

This increase has resulted from the funding for Special programs, Initiative for Future Agricultural and Food Systems (IFAF). This program has been discontinued. Even after discounting the influence of IFAF program, there had been a steady increase in the CSREES spending for F&NFPP from 1998 to 2002. The CSREES investment in 2002 was about 30% higher than the same in 1998.

Annual distribution of CSREES funds for different problem areas within F&NFPP during 1988-1992 is shown in Table 2. A direct correlation between activities within the problem areas as indicated by the number of projects (Table 5) and dollar expenditure can be seen on this table. In other words, almost all of CSREES allocations went into the four knowledge areas 501, 502, 503, and 511/512. IFAF funding is reflected in different problem area funding during 2001 and 2002. While an increase in CSREES investment is seen in KAs 501, 502, the allocation remained somewhat steady for KA 511/512. The 202 funding for KA 501 and 502 was higher than the same in 1998 by 73% and 32%, respectively. No set trends were observed in the other two areas.

The total research spending for F&NFPP during the period 1998-2002 is shown in Table 3. Contributions from CSREES, other federal agencies, state and private sources are included in this table. One important observation from this table is that over 40% of the total annual research expenditure for F&NFPP each year came from states. It is also interesting to note that every CSREES dollar has generated $4 - $5 from other sources to meet the research needs in different problems areas within F&NFPP.

A summary of total manpower and total dollar investment for each problem area within F&NFPP are shown in Table 4. As observed earlier almost all of the annual total expenditure was consumed by KAs 501, 502, 503, and 511/512. The same was true even for the manpower input in terms of scientific years (SY) and professional years (PY).

The F&NFPP is diverse. It cuts across several disciplines and several commodities and forest products. The portfolio covers highly relevant and timely research developed to meet national priorities established based on stakeholder inputs. As stated earlier, there is a good mix of applied and basic research.

The research is also of high quality. It employs cutting edge technologies and multi-disciplinary approaches to find solutions to highly complex problems. The research within the F&NFPP is significant because it has the potential to make agriculture in the U.S. more sustainable by finding new uses for agricultural materials and to provide high quality food products that society demands.

2. **Performance Measures**

1. A. *Measure Description:* Expand commercially adaptable processes that convert biomass to fuels through the development of cost effective biochemical or thermochemical technologies.

   B. *Measure Explanation*: These processes in conversion of cellulose to fermentable sugars, chemical transesterification of oils from oilseed crops, and the thermal pyrolysis and gasification of biomass will have been increased by 2009. These will increase the biofuel conversion and utilization for U.S. consumers.

Time Frame	Target	Actual	Development: Baseline/Target
2005	Baseline	3	Conversion technologies that will be adaptable for commercialization by 2009 = 4; 1) new biocatalysts for conversion of cellulose to ETOH or chemicals; 2)new chemical catalysts for production of biodiesel; 3) new biocatalysts for production of biodiesel; 4) pyrolysis for production of bio-oils; 5) gasification to produce syngas; 6) syngas conversion to liquid fuel
2006	1		
2007	1		
2008	1		
2009	1		

VI. A. *Measure Description:* Expand the number of biobased industrial products that have been developed to the precommercialization stage or have been commercialized:

Biobased products fall under a variety of broad categories

B. *Measure Explanation:* Products are biodegradable, as appropriate and utilize oils, proteins, starches, or lignocellulosic materials. Biobased products will open new markets for these materials and will increase availability of environmentally preferable products for US consumers.

Time Frame	Target	Actual	Development: Baseline/Target
2005	Baseline	45	30 of 45 products are based on soybean oil formulations developed at University of Northern Iowa for specific applications
2006	1		
2007	1		
2008	1		

VII. A**.** *Measure Description:* Expand the number of unique biomass feedstocks that have been developed to the precommercialization stage or have been commercialized for production of agricultural raw materials.

B. *Measure Explanation:* New crops or biotech crops provide agricultural materials with properties that are chemically and physically unique. New crops provide diversity, new sources of revenue, and can be grown sustainably with reduced inputs.

Time Frame	Target	Actual	Development: Baseline/Target
2005	Baseline	3	3 new oilseed crops have been developed as source of industrial oil, one fiber crop for specialty paper products, and one crop for hypoallergenic latex
2006	1		
2007	1		
2008	1		

V. Evidence of Progress

1. **Development of Xylose-Specific Transporters for Further Improvement of Glucose/Xylose Co-Fermenting Saccharomyces Yeast**, Purdue University. This project will continue to optimize a genetically engineered yeast currently used commercially to convert sugars derived from cellulose and hemi-cellulose to ethanol. Optimization will include developing genes encoding a xylose-specific transport protein and continued efforts to make the yeast co-ferment galactose with glucose and xylose, and to complete efforts to make the yeast co-ferment L-arabinose. This yeast biocatalyst has been supported with National Research Initiative funding and is currently being used by Iogen Biorefinery Partners LLC. The company was recently awarded a DOE Biorefinery grant to scale up cellulosic ethanol production from barley and wheat straw and other farm wastes, in Shelley Idaho.

2. **Biomass-Based Energy Research,** Oklahoma State University/Mississippi State University/University of Oklahoma. This research links biomass gasification and fermentation technologies to produce ethanol and chemicals. The project is comprehensive in scope and includes optimizing energy crops, tailoring gasification to the feedstock, and it includes an economic analysis to determine the potential economies of scale from a coordinated biorefinery operation that includes harvesting and handling. Through the establishment of the Oklahoma State University, University of Oklahoma, and Mississippi State University Consortium, the three universities are developing an ethanol gasification-bioconversion process that utilizes all of the plant biomass, including the lignin. While making the process more cost efficient than other methods of ethanol production, this process utilizes all portions of a variety of biomass and feedstock material that includes grasses, crop residues, and processing plant byproducts. The primary goal is to develop a holistic, cost-effective biomass conversion-to-ethanol production system utilizing a unique gasification-fermentation process. Breeding efforts for bermudagrass and switchgrass as energy crops have resulted in genetic improvement and new cultivar development. Additional biomass feedstocks such as cotton gin waste and sawdust have been processed to evaluate handling and storage, material composition, and synthesis gas yield and quality. Two gasifiers, a fluidized-bed reactor and a downdraft unit, have been optimized using switchgrass, bermudagrass, and corn fermentation waste as inputs. Synthesis gas produced from the gasification process has been evaluated for quantity and quality from a variety for biomass sources. The microbial catalyst used in the fermentation process continues to be optimized for more efficient production of ethanol.

3. **Value-Added Products from Agricultural Commodities**, Purdue University. This research is addressing the use of mixtures of soybean methyl esters, i.e. biodiesel, with jet fuel, quantifying the physical properties and measuring turbine jet engine combustion performance and emissions. Aviation jet fuels are a unique energy fuel market due to the critical nature of fuel weight/energy density required for jet flight. A key performance limitation of soy methyl esters is the very low freezing point required for jet fuel. This project has developed a fractionation technology that removes the saturated components to produce workable fuel blends with existing jet fuels. The byproduct of biodiesel production is glycerin. This project is also evaluating the use of glycerin for aviation

deicers to replace ethylene/propylene glycol deicers. The fractionation process and glycerin deicer product are being patented and Purdue is working with industrial partners to commercialize the technologies.

VI. 2005 Self Score of Portfolio

Relevance
1.4 Integration
Demonstrate functional integration of CSREES research, extension and education efforts in the portfolio

Score 2

Rationale:
The National Research Initiative has the authority to fund up to 20% of its annual budget for integrated projects. There is an increased number of relevant NRI programs that have included integrated priorities in the annual request for applications, including 22.1, 12.1, 28.0, 52.2, 66.0, and 71.1.

In the National Research Initiative(NRI) competitive grants program, the old title for Improving Food Quality has been changed to Improving Food Quality and Value (71.1) to reflect the addition of an Integrated component (up to 20% 0f the total funding). In fiscal year 2005, we funded one integrated proposal. For fiscal year 2006, we have reinforced this component at several workshops and multi-state research meetings and to potential end users for submission of integrated proposals. Panels for 2006 will have special instructions for evaluating the integrated proposals.

A multistate committee, S-1007 Science and Engineering for a Biobased Industry and Economy, consisting of scientists representing research, education and extension from all over the country, has been holding annual meetings since 2001. This is an excellent forum to develop integrated approaches to address critical issues in this important area.

An Emerging Food Technologies Workshop involving academe, government and industry scientists was held to discuss not only the state-of-the science, but also to explore integrated approaches to developing new technologies.

Quality
2.2 Stakeholder/Constituent Inputs
Demonstrate stakeholder/constituent input to the portfolio

Score 3

Rationale:
The process is described in the performance elements for NPLs. Stakeholder input is accomplished through: workshops hosted by government agencies, academia, trade associations and professional societies; collaboration with the Council for Agricultural Science and

Technology (CAST); stakeholder comments on RFA's, competitive review panel discussions, panel manager reports; and NPL participation in professional societies.

Performance
3.3 Portfolio Timeliness
Demonstrate the extent to which funded activities were completed within funding time frame

Score 2

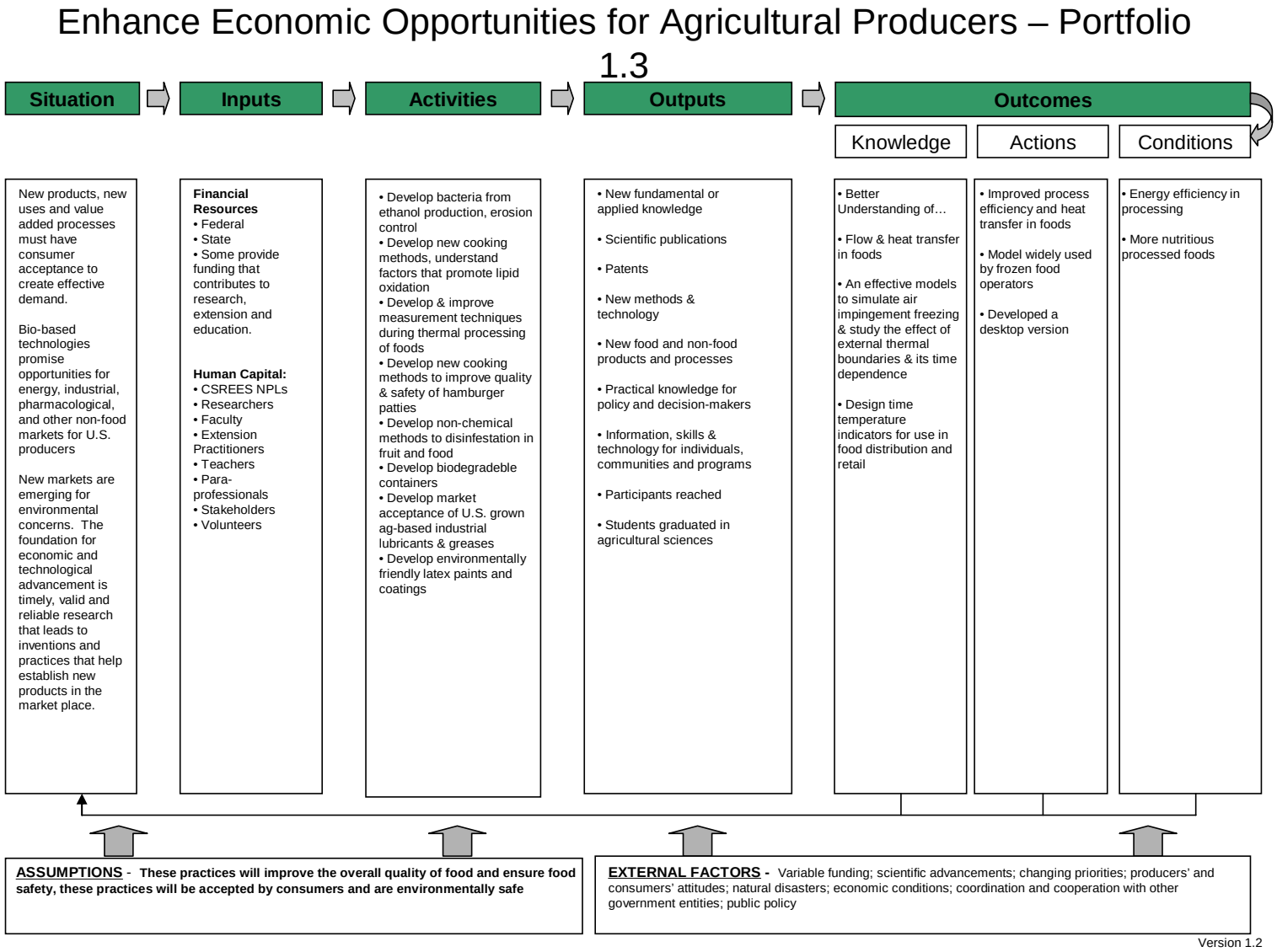
Rationale:
Delays in budget approvals typically results in delayed RFA releases. However, Improving Food Quality and Value program has reduced the time-to-informing the awardees from 8 months to about 6months. CSREES has streamlined the Hatch proposal review process. Evidentiary material presented to PREP did not reflect the timeliness completely.

A rigorous procedure has been instituted for the review of CRIS termination reports. Unsatisfactory reports can prevent any further funding to the program director.

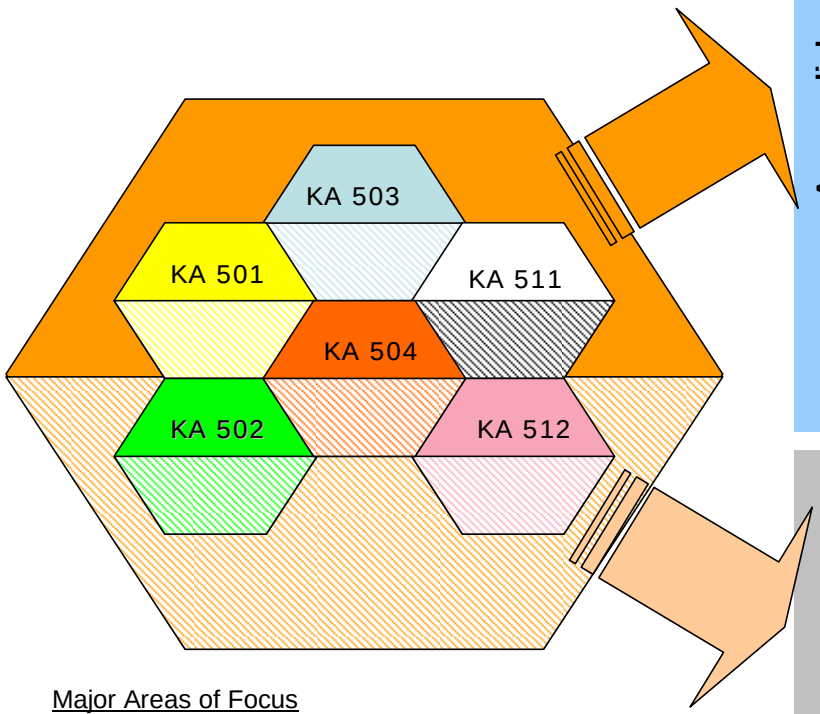
VII. Summary

Recommendations were made from the external review panel in 2005, and Portfolio 1.3 has instituted a number of programs, researched a number of areas and expanded educational and integrated activities to address these recommendations. Panelist recommended more collaboration between National Program Leaders (NPLs) and other federal teams and between NPLs and stakeholders. National Program Leaders have been collaborating with a number of teams to facilitate advancements and improvements in bio-based technologies, bio-products and energy. Stakeholders/constituents have been given additional opportunities for collaborations with NPLs in regards to the efforts of this portfolio. In addition, panelist made recommendations concerning advancing efforts in biobased resources. Educational activities focus on biobased resources have increased and expanded throughout the nation's universities. Panelist recommended updating funding tables, long term and annual measures and the CRIS database. CSREES funding for F&NFPP has been undated to show changes by funding source and by individual knowledge areas (KA). New BPI, PART, among others, long term and annual measures were instituted and development within the portfolio was demonstrated based on these new measures. With instituting more rigorous procedures for reviewing CRIS termination reports, it is expected that funded activities will be completed within its proposed time. CSREES has also improved its integrated efforts for research, extension and education in order to gain a full understanding of the accomplishments that this portfolio has made in order to advance the area of foods and non-foods. Portfolio 1.3 has made significant progress in addressing the external review panelists' recommendations, the needs of stakeholders, and achieving its overall goal.

Appendix: Portfolio Graphics



Portfolio 1.3 – Food and Non-Food Products: Development, Processing, Quality, and Delivery



Major Areas of Focus

Fundamental understanding of sophisticate flow patterns of impacts on cooking foods

•Jet impingement freezing over conventional freezing methods

•Understand bioavailability of health components

•Biodegradable food packaging

•Development and optimization of designer organisms

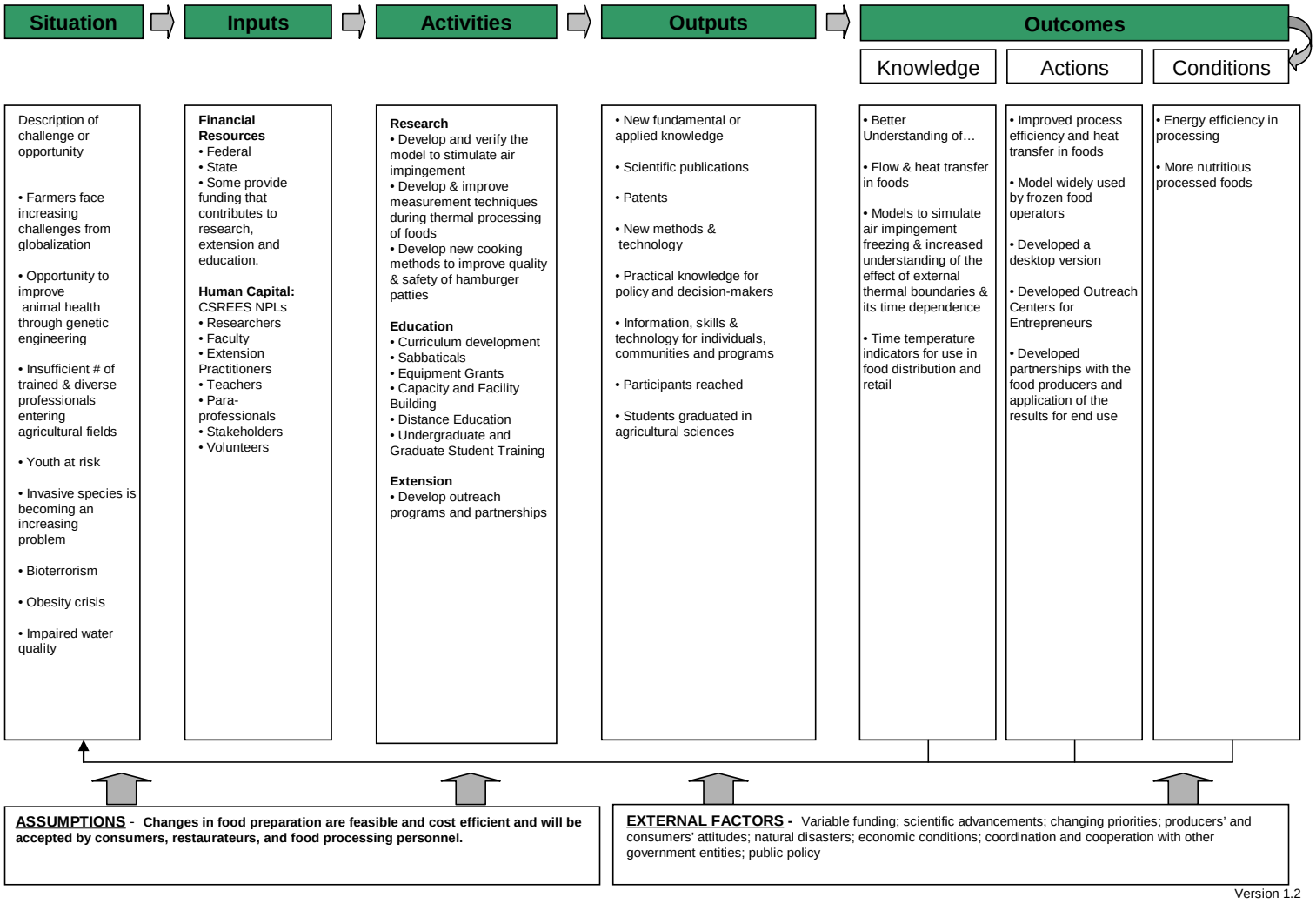
Accomplishments

•Better understanding of flow & heat transfer in foods
•Effective model to simulate air impingement
•Improved understanding of lipid oxidation in foods
•Knowledge of lipid chemistry in food emulsion
•Food components developed with stable health components using emulsions
•Elimination of chemical disinfestations of stored food products
•Basic understanding of chemical and biochemical changes in food during storage & distribution
•Better food service delivery methods
•Genetically engineered bacteria to convert agricultural residues
•Cloned genes used for ethanol conversion

Needs

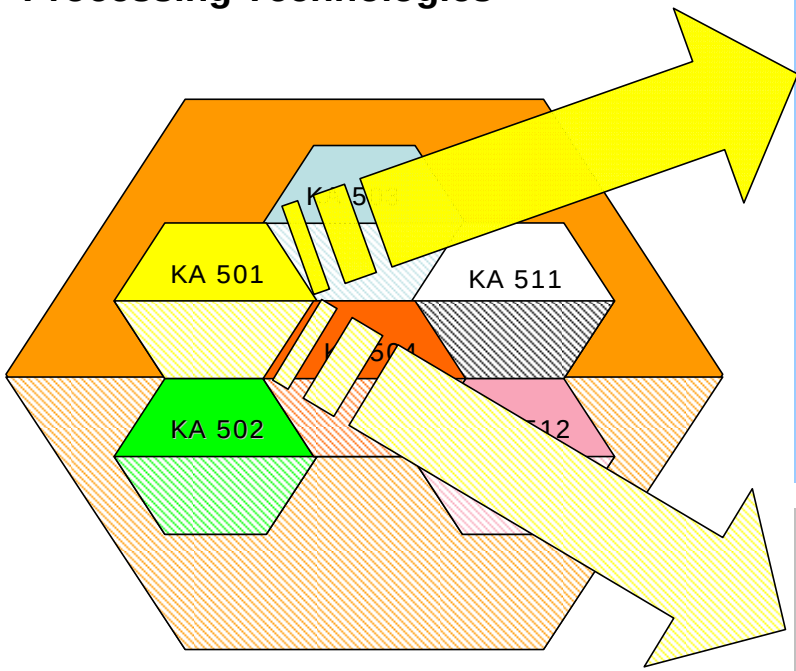
knowledge and application of creative and innovative erosion control materials for forest and wildlands
•Development of biomass treatment, bioconversion and separation techniques
•Environmentally benign and safe food preservatives
•Energy efficient cold storage technologies
•Understanding chemical, biological, and physical causes in food as influenced by stable and distribution practices

Knowledge Area 501: New and Improved Food Processing Technologies



Version 1.2

KA 501: New and Improved Food Processing Technologies



Major Areas of Focus:

1. Improve efficiency of jet impingement freezing over conventional freezing methods
2. Improve frozen food quality by the new technology
3. Fundamental understanding of sophisticate flow patterns of impacts on cooking rates of food
4. Enhance intelligent manufacturing capabilities of food processing through development in mathematical modeling and computer simulations

Accomplishments

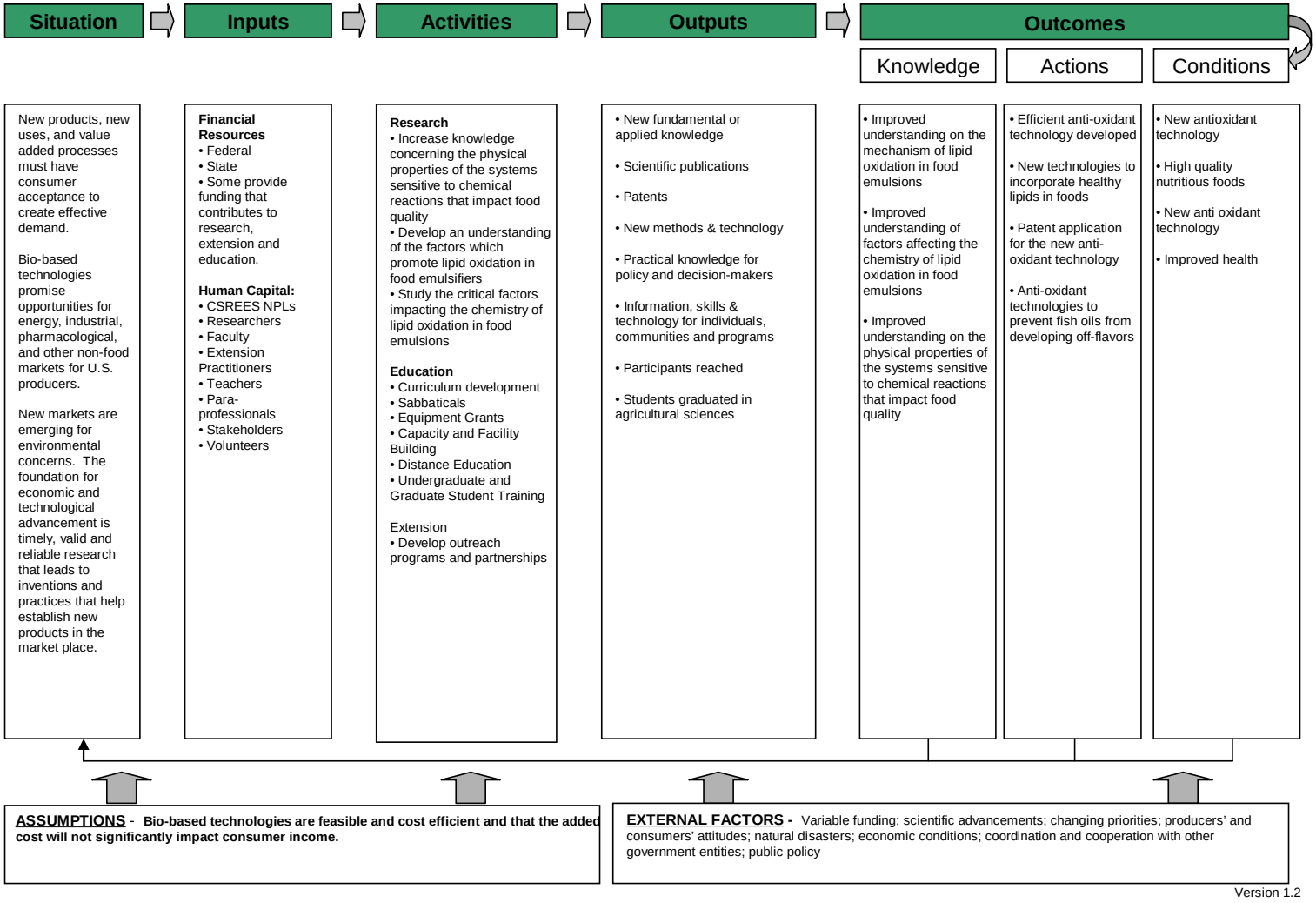
- Better understanding of flow & heat transfer in foods
- Effective model to simulate air impingement

Needs

More research needed to maximize knowledge and application of cooking methods

- Improve efficiency of jet impingement freezing over conventional freezing methods
- Improve frozen food quality by the new technology
- Fundamental understanding of sophisticate flow patterns of impacts on cooking rates of food
- Enhance intelligent manufacturing capabilities of food processing through development in mathematical modeling and computer simulations

Knowledge Area 502: New and Improved Food Products



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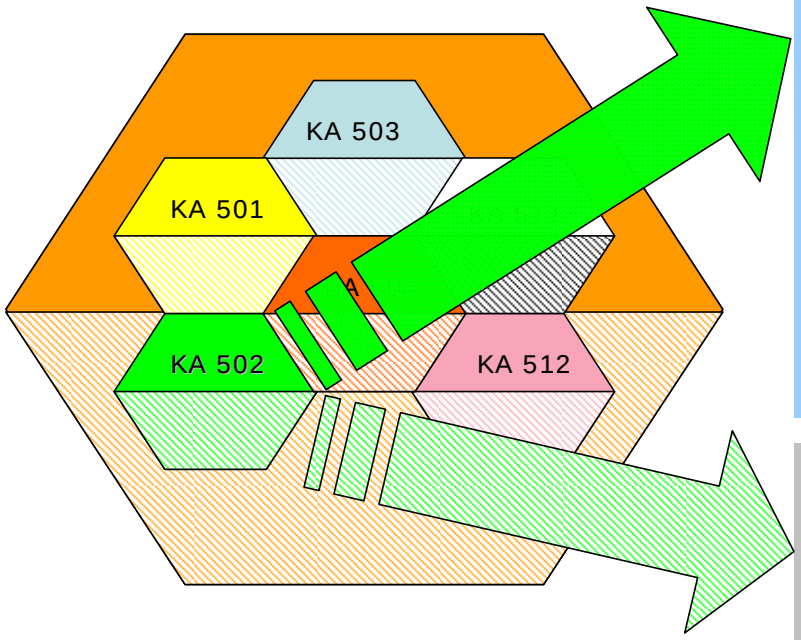
KA 502: New and Improved Food Products



Major Areas of Focus:
1. Bioavailability of health components from products
2. Commercialization of products both domestically and internationally

Accomplishments

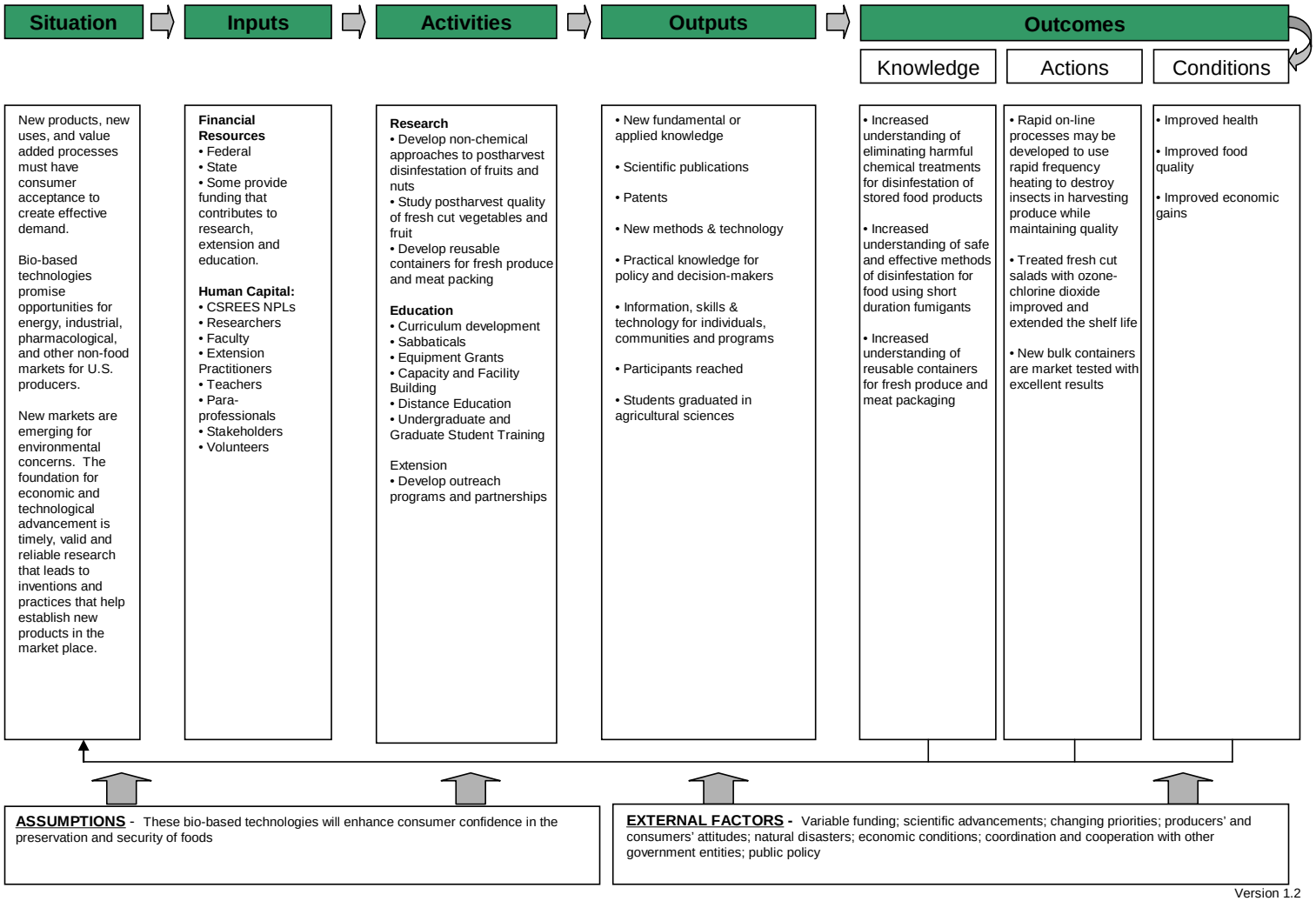
- Improved understanding of lipid oxidation in foods
- Stable emulsions developed in protecting health components food products
- Food components developed with stable health components using emulsions
- Knowledge of lipid chemistry in food emulsion

Needs

More needs to be done in the following areas:

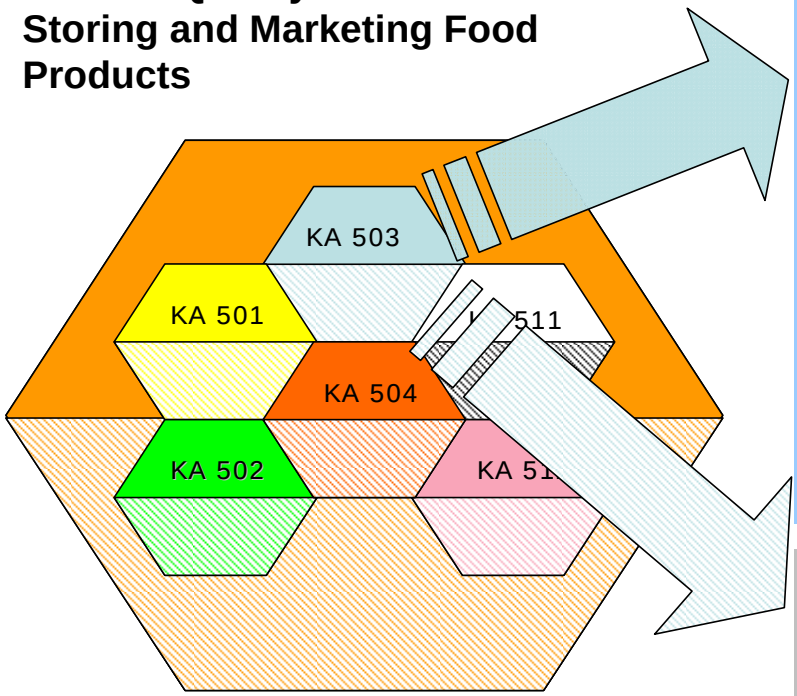
- Demonstrate bioavailability of health components from products
- Assist in commercialization of products both domestically and internationally

Knowledge Area 503: Quality Maintenance in Storing and Marketing Food Products



Version 1.2

KA 503: Quality Maintenance in Storing and Marketing Food Products



Major Areas of Focus:

1. Understanding chemical, biological, and physical causes in food as influenced by stable and distribution practices
2. Improved packaging and stable technologies
3. New biodegradable food packaging
4. controlled atmosphere packaging
5. Environmentally benign and safe food preservatives
6. Energy efficient cold storage technologies

Accomplishments

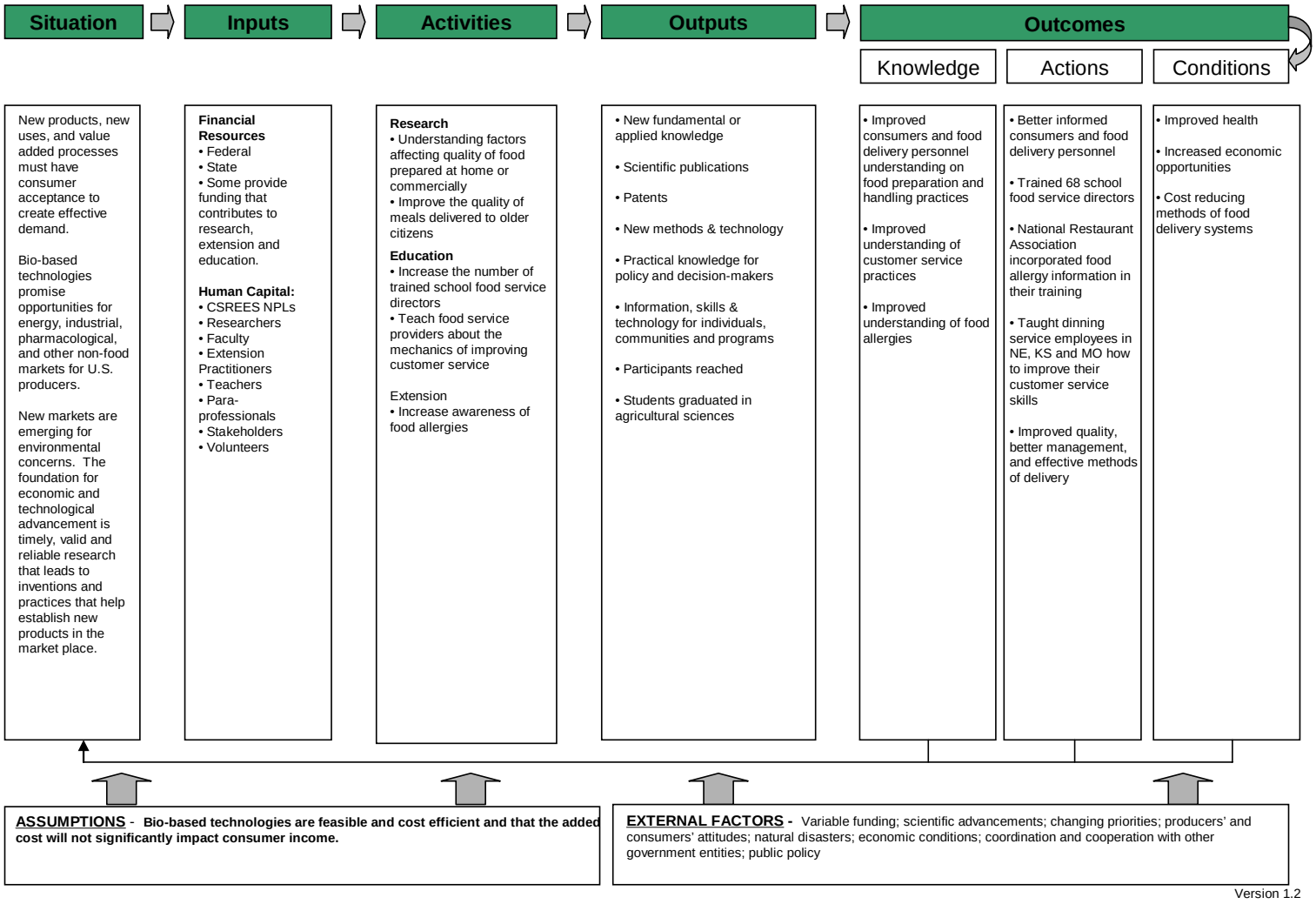
- Elimination of chemical disinfection of stored food products
- Basic understanding of chemical and biochemical changes in food during storage & distribution
- Food storage and handling technology

Needs

Additional work needed:

- Understanding chemical, biological, and physical causes in food as influenced by stable and distribution practices
- Improved packaging and stable technologies
- New biodegradable food packaging
- Controlled atmosphere packaging
- Environmentally benign and safe food preservatives
- Energy efficient cold storage technologies

Knowledge Area 504: Home and Commercial Food Service



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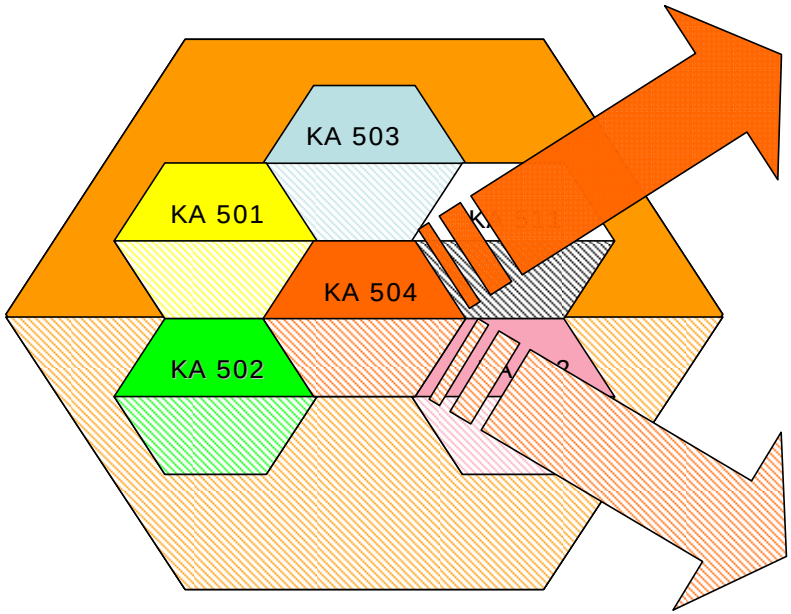
KA 504: Home and Commercial Food Service



Major Areas of Focus:

1. Developing novel means to facilitate consumer food purveyors decision-making on food quality, appeal, and values
2. Better provision of information on vast amount information readily available on obesity, nutrition, food safety, and economics
3. Guide the industry and food appliance manufacturers to add value to their products

Accomplishments

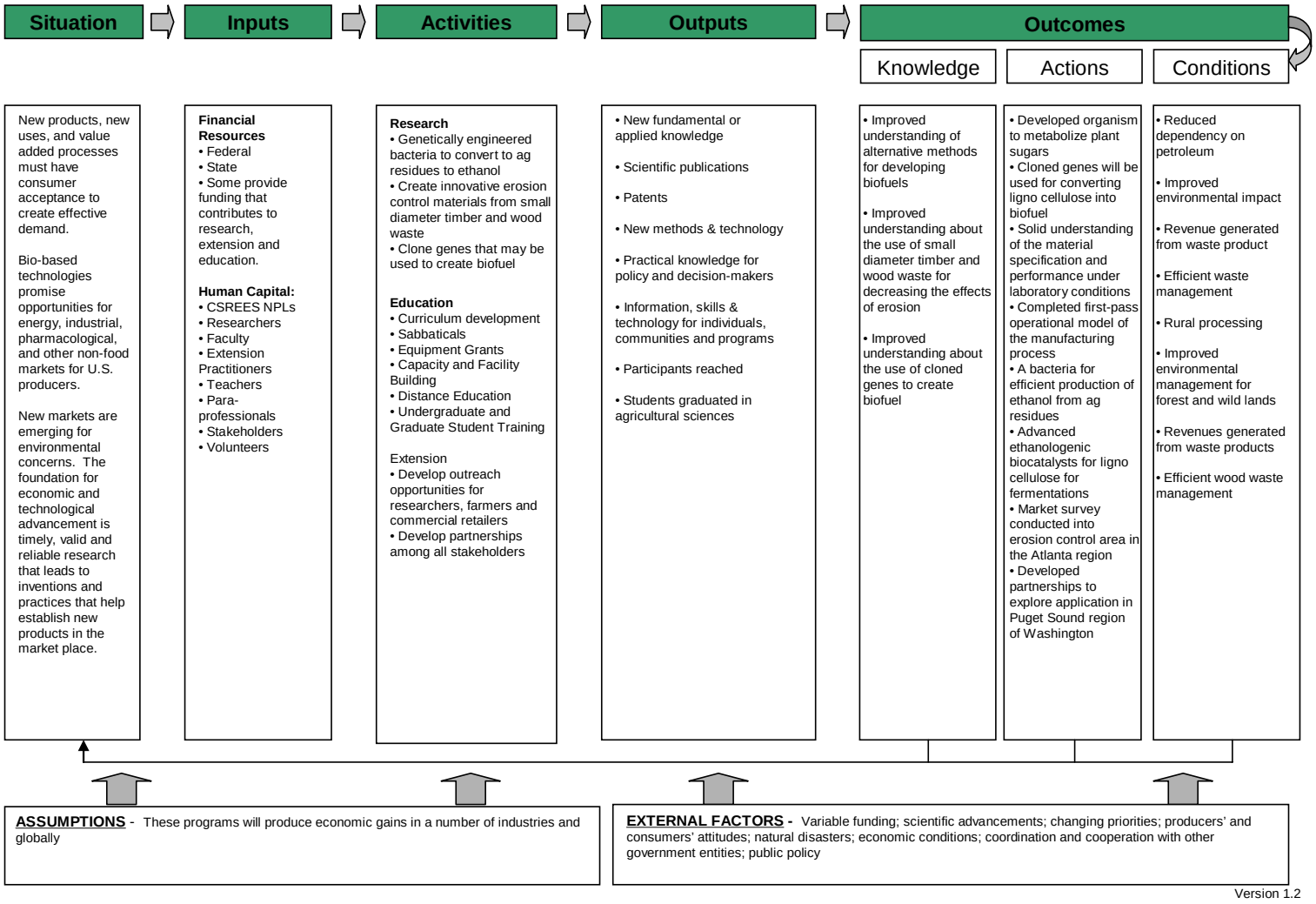
- Increased knowledge in meals preparation
- Better food service delivery methods
- Effective management practices

Needs

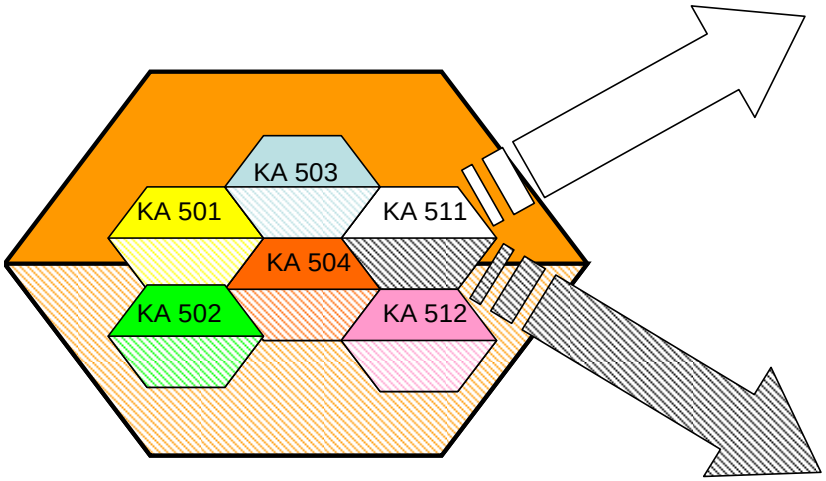
Focus areas include:

- Developing novel means to facilitate consumer food purveyors decision-making on food quality, appeal, and values
- Better provision of information on vast amount information readily available on obesity, nutrition, food safety, and economics
- Guide the industry and food appliance manufacturers to add value to their products

Knowledge Area 511: New and Improved Non-Food Products and Processes



KA 511: New and Improved Non-Food Products and Processes



Major Areas of Focus

1. Development and optimization of designer organisms
2. Development of feedstock harvesting
3. Development of better management and transportation mechanisms
4. Development of biomass treatment, bioconversion, and separation techniques

Accomplishments

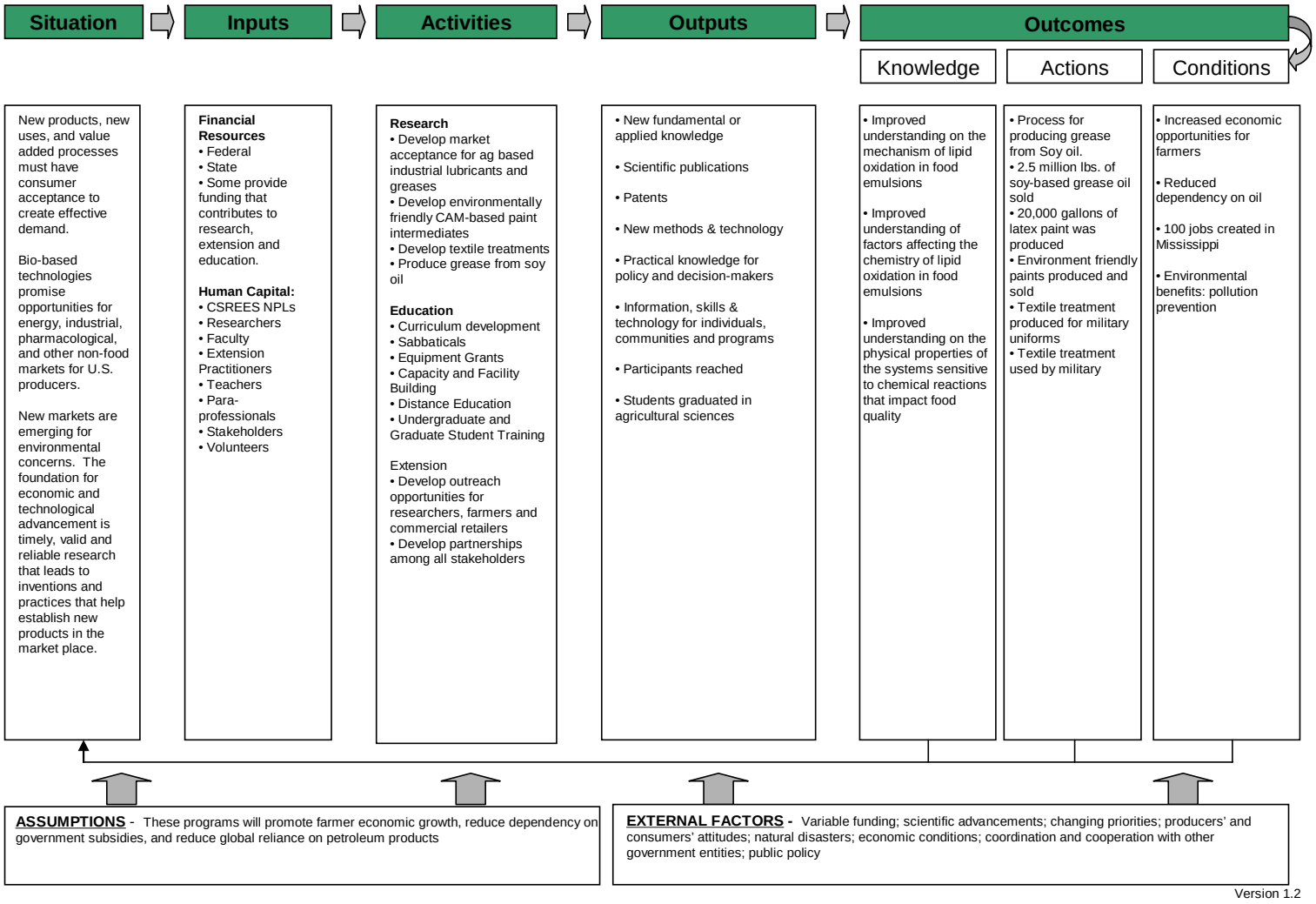
- Genetically engineered bacteria to convert agricultural residues
- Cloned genes used for ethanol conversion
- New knowledge on material specifications

Needs

More research needed for…

- Development and optimization of designer organisms
- Development of feedstock harvesting
- Development of better management and transportation mechanisms
- Development of biomass treatment, bioconversion and separation techniques
- Maximizing knowledge and application of creative and innovative erosion control materials for forests and wildlands

Knowledge Area 512: Quality Maintenance in Storing and Marketing Non-Food Products



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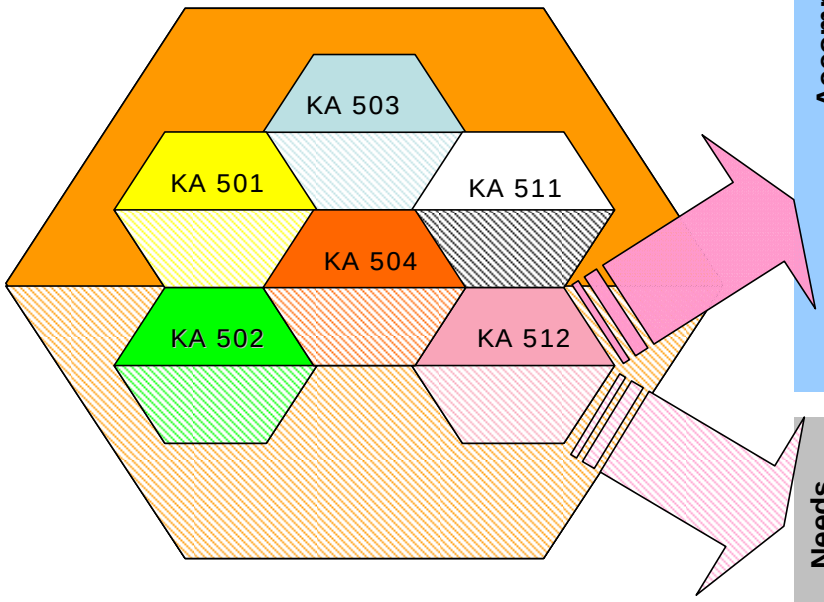
KA 512: Quality Maintenance in Storing and Marketing Non-Food Products



Major Areas of Focus:

•Shelf life and storage

•Product performance and standards

Accomplishments

- New knowledge on farm produced soy oil
- Grease produced from soy oil - 2.5 M lbs sold
- CAM-based and latex paint developed

Needs

More research needed to maximize knowledge and application of agricultural-based industrial lubricants in:

- Shelf life/
- Product performance and standards